IN THE CLAIMS

The claims as they currently stand are provided for the Examiner's convenience:

1. (Previously Presented) In a Constant Access Time Bounded (CATB) cache, a method comprising:

reserving a first number of unallocated lines in the cache for pinned data, the first number being less than the number of lines in the cache; and

if data needs to be inserted into the cache as pinned data,

selecting a line from the lines reserved for pinned data;

storing the data in the line; and

inserting the line into a search group of the CATB cache, wherein a constant number of non-pinned lines are maintained within the search group.

2. (Original) The method of claim 1 wherein each line of the cache is stored in non-volatile memory.

3. (Original) The method of claim 2 further comprising:

recovering the organization of the cache on power up following a loss of power to the cache by

in a first phase of recovery, for each line in the cache

determining if the line is allocated;

if the line is allocated, inserting the line in a search group of the cache; and

if the line is not allocated, inserting the line into a pool of free lines; and

in a second phase of recovery, for each search group

determining the number of pinned lines in the search group; and

adding at least one line from the pool of free lines to each search group that has at least one pinned line.

4. (Original) The method of claim 3 wherein the cache is a disk cache in a processor based system.

5. (Original) The method of claim 1 wherein inserting the line into a search group of the cache further comprises:

indicating that the line is allocated;

indicating that the line is pinned; and

using a tag of the line to map the line to a search group of the cache.

6. (Original) The method of claim 5 wherein:

the CATB cache is implemented as a set-associative cache;

each search group of the cache is a set of the cache; and

inserting the line into a search group of the cache further comprises:

using the address of the data as the tag of the line;

performing a modulus operation between the tag and the number of sets (N) in the cache (the tag MOD N) to map the tag to a set of the cache;

performing a search based on the tag of the line; and

inserting the line into a dynamic data structure that represents the set.

7. (Original) The method of claim 6 wherein indicating that the line is pinned further comprises modifying metadata associated with the line to indicate that the line is pinned.

8. (Previously Presented) For a whole number N, in an N-way set associative non-volatile disk cache, a method comprising:

reserving a predetermined number of lines for pinned data and organizing them into a pool of lines for pinned data;

distributing the remaining lines in the cache into N dynamic data structures of approximately the same size to represent the N sets of the cache;

if data is to be inserted into the cache as pinned data,

inserting the data into a line from the pool for pinned data;

marking the line as allocated by modifying metadata associated with the line;

determining the set to which the line belongs using a mapping based on the tag associated with the line;

removing the line from the pool for pinned data; and

adding the line to the set, wherein a constant number of non-pinned lines are maintained within the set.

9. (Original) The method of claim 8 further comprising:

recovering the organization of the cache on power up following a loss of power to the cache by

in a first phase of recovery, for each line in the cache

determining if the line is allocated;

if the line is allocated, inserting the line in a set of the cache using a mapping based on the tag associated with the line; and

if the line is not allocated, inserting the line into a pool of unallocated lines; and

in a second phase of recovery, for each set in the cache

determining the number of pinned lines in the set using the metadata associated with each line in the set; and

moving one or more lines from the pool of unallocated lines to each set that has at least one pinned line so that the number of non-pinned lines in each set is approximately the same.

10. (Previously Presented) An apparatus comprising:

an N-way set associative cache implemented in non-volatile memory;

a pinned data portion of the non-volatile memory to store a pool of lines for pinned data; and

a pinned data insertion module to

insert pinned data into a line from the pool of lines for pinned data;

mark the line as being allocated by modifying metadata associated with the line;

determine a set to which the line belong using a mapping based on the tag associated with the line;

remove the line from the pool for pinned data; and

add the line to the set, wherein a constant number of non-pinned lines are maintained within the set.

11. (Original) The apparatus of claim 10 further comprising

a power source to provide power to the cache; and

a recovery module to recover the organization of the cache on power up following

a loss of power to the cache from the power source by

in a first phase of recovery, for each line in the cache

determining if the line is allocated;

if the line is allocated, inserting the line in a set of the cache using a mapping based on the tag associated with the line; and

if the line is not allocated, inserting the line into a pool of unallocated lines; and

in a second phase of recovery, for each set in the cache

determining the number of pinned lines in the set using the metadata associated with each line in the set; and

moving one or more lines from the pool of unallocated lines to each set that has at least one pinned line so that the number of non-pinned lines in each set is approximately the same.

12. (Previously Presented) A system comprising:

a processor;

a disk communicatively coupled to the processor;

an N-way set associative cache implemented in non-volatile battery-backed up Dynamic Random Access Memory communicatively coupled to the processor;

a pinned data portion of the non-volatile memory to store a pool of lines for pinned data; and

a pinned data insertion module to

insert pinned data into a line from the pool of lines for pinned data;

mark the line as being allocated by modifying metadata associated with the line;

determine a set into which the line using a mapping based on the tag associated with the line;

remove the line from the pool for pinned data; and

add the line to the set, wherein a constant number of non-pinned lines are maintained within the set.

13. (Previously Presented) A tangible machine readable medium having stored thereon data which when accessed by a machine causes the machine to perform a method the method comprising:

reserving a first number of unallocated lines in the cache for pinned data, the first number being less than the number of lines in the cache; and

if data needs to be inserted into the cache as pinned data,

selecting a line from the lines reserved for pinned data,

storing the data in the line; and

inserting the line into a search group of the CATB cache, wherein a constant number of non-pinned lines are maintained within the search group.

14. (Previously Presented) The tangible machine readable medium of claim 13 wherein each line of the cache is stored in non-volatile memory.

15. (Previously Presented) The tangible machine readable medium of claim 14 wherein the method further comprises:

recovering the organization of the cache on power up following a loss of power to the cache by

in a first phase of recovery, for each line in the cache

determining if the line is allocated;

if the line is allocated, inserting the line in a search group of the cache; and

if the line is not allocated, inserting the line into a pool of free lines; and

in a second phase of recovery, for each search group

determining the number of pinned lines in the search group; and

adding at least one line from the pool of free lines to each search group that has at least one pinned line.

16. (Previously Presented) The tangible machine readable medium of claim 15 wherein the cache is a disk in a processor based system.

17. (Previously Presented) The tangible machine readable medium of claim 13 wherein the method further comprises:

indicating that the line is allocated;

indicating that the line is pinned; and

using a tag of the line to map the line to a search group of the cache.

18. (Previously Presented) The tangible machine readable medium of claim 17 wherein the method further comprises:

the CATB cache is implemented as a set-associative cache;

each search group of the cache is a set of the cache; and

inserting the line into a search group of the cache further comprises

using the address of the data as the tag of the line;

performing a modulus operation between the tag and the number of sets (N) in the cache (the tag MOD N) to map the tag to a set of the cache;

performing a search based on the tag of the line; and

inserting the line into a dynamic data structure that represents the set.

19. (Previously Presented) The tangible machine readable medium of claim 18 wherein indicating that the line is pinned further comprises modifying metadata associated with the line to indicate that the line is pinned.

20. (Previously Presented) A tangible machine readable medium having stored thereon data which when accessed by a machine causes the machine to perform, for a whole number N, in an N-way set associative non-volatile disk cache, a method comprising:

reserving a predetermined number of lines for pinned data and organizing them into a pool of lines for pinned data;

distributing the remaining lines in the cache into N dynamic data structures of approximately the same size to represent the N sets of the cache;

if data is to be inserted into the cache as pinned data,

inserting the data into a line from the pool for pinned data;

marking the line as allocated by modifying metadata associated with the line;

determining the set to which the line belongs using a mapping based on the tag associated with the line;

removing the line from the pool for pinned data; and

adding the line to the set, wherein a constant number of non-pinned lines are maintained within the set.

21. (Previously Presented) The tangible machine readable medium of claim 20 further comprises:

recovering the organization of the cache on power up following a loss of power to the cache by

in a first phase of recovery, for each line in the cache

determining if the line is allocated;

if the line is allocated, inserting the line in a set of the cache using a mapping based on the tag associated with the line; and

if the line is not allocated, inserting the line into a pool of unallocated lines; and

in a second phase of recovery, for each set in the cache

determining the number of pinned lines in the set using the metadata associated with each line in the set; and

moving one or more lines from the pool of unallocated lines to each set that has at least one pinned line so that the number of non-pinned lines in each set is approximately the same.

22-27. (Cancelled)